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ABSTRACT

This study examines the developmental status of young mothers' social and logical-physical reasoning in relation to the characteristics of their interactions with their infants. A total of 36 mothers 15 to 21 years of age and their 4-month-old infants were videotaped in their homes during play, infant teaching, and bathing. Selman's "concepts of persons" interview, revised to an infant crying situation, was conducted at a second visit. During a third visit, multiple formal operations measures and an intellectual aptitude measure, the Raven Progressive Matrices, were administered. Data indicated that availability of certain formal operations is correlated with the quantity of verbal stimulation in mothers' teaching schemes. These data were, however, highly related to the effects of intellectual aptitude. By contrast, more advanced concepts of persons are associated with greater verbal stimulation and more accepting maternal behavior independent of intellectual aptitude. Cognitive-developmental status has different effects across caregiving situations; social reasoning is strongly related to bathing behavior, and the availability of certain formal operations is moderately related to teaching behavior. Findings are discussed in reference to explanatory models for widely reported deficiencies in adolescent maternal behavior. (Author/RH)

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CONSTRUCTING MOTHER-INFANT INTERACTIONS: A COGNITIVE-DEVELOPMENTAL ANALYSIS OF YOUNG MOTHERS' INTERACTIVE SCHEMES

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Abstract

CONSTRUCTING MOTHER-INFANT INTERACTIONS:
A COGNITIVE-DEVELOPMENTAL ANALYSIS
OF YOUNG MOTHERS' INTERACTIVE SCHEMES

Consolidation of logical reasoning structures and the development of associated social intelligence are purported to occur between ages 15 and 20 in accordance with an individual's vocational and life roles (Piaget, 1972). Presumably parenting is one such role. Newly acquired reasoning skills would be expected to extend to parent-child interactions. This study examines the developmental status of young mothers' social and logical-physical reasoning in relation to the characteristics of their mother-infant interactions.

Thirty-six mothers age 15 to 21 years and their four-month-old infants were videotaped in their homes during play, infant teaching, and bathing. Selman's "concepts of persons" interview, revised to an infant crying situation, was conducted at a second visit. During a third visit, multiple formal operations measures and an intellectual aptitude measure (Raven Progressive Matrices) were administered.

The resulting data indicate that availability of certain formal operations is correlated with the quantity of verbal stimulation in mothers' teaching schemes. These data are, however, highly related to the effects of intellectual aptitude. By contrast, more advanced concepts of persons are associated with greater verbal stimulation and more accepting maternal behavior independent of intellectual aptitude. Cognitive-developmental status has different effects across caregiving situations; social reasoning is strongly related to bathing behavior and the availability of certain formal operations is moderately related to teaching behavior. These data are discussed in reference to explanatory models for widely reported deficiencies in adolescent maternal behavior.

INTRODUCTION

Current adolescent parenting research suggests that adolescent mothers perform differently and more inadequately than older mothers in mother-infant interactions. The most consistently reported finding shows a lack of verbal stimulation in adolescent mother-infant interactions (Culp, Culp, and Levy, 1986; Green, Sandler, Altmeier, and O'Connor, 1981; Levine, Coll, and Oh, 1985). In addition, adolescents are reported to display a lack of fine-tuning in their interactions with their infants (Field, 1981). Finally, adolescents have attitudes toward their infants and toward the parenting experience characterized by unrealistic expectations for infant development (Epstein, 1979) and by a lack of appreciation for the emotional complexities inherent in rearing a child (Green, Sandler, Altmeier, and O'Connor, 1981).

Two explanatory models have emerged to explain differences in adolescent and adult maternal behavior. One model assigns primary importance to the socioeconomic factors and psychological trait factors characteristic of adolescent mothers, the most important of which is their lower educational achievements and their poverty (Roosa, Fitzgerald, and Carlson, 1982; McAnarney, Lawrence, Aten, and Iker, 1984). The other model explains age-related differences on the basis of psychological developmental functions that are not fully functional for some of the problem-solving situations that new parents encounter. To adequately test the explanatory power of the two competing models, developmental analyses of parental cognition and subsequent

parental actions are needed. More importantly than simply allowing testing of the models, however, such analyses can begin to provide clues about the mechanisms that mothers, at various stages of cognitive development, use to transform their thoughts into actions.

This study uses one developmental approach, the Piagetian cognitive-developmental model, to examine the developmental status of young mothers' interpersonal and logical physical reasoning in relation to the characteristics of their mother-infant interactions.

Theoretical Considerations

In Piagetian cognitive-developmental theory, the emergence of formal operations in early adolescence ushers in new logical-physical and interpersonal reasoning abilities thereby expanding the adolescent's capacity for problem-solving and interpersonal relationships. These new reasoning abilities may also lead the adolescent into new forms of egocentrism characterized by heightened self-awareness, heightened self-knowledge, and an exaggerated sense of personal agency (Elkind and Bowen, 1979; Selman, 1980). A gradual decline in adolescent egocentrism and a more accurate and sensitive perception of one's self and of others are believed to be the result of the development of more advanced interpersonal concepts (Elkind, 1967; Lapsley and Murphy, 1985). Likewise, consolidation of logical reasoning structures is believed to enhance problem-solving skills. This consolidation of formal operations is purported to occur between 15 and 20 years in accordance with an individual's

vocational and vital life roles (Piaget, 1972). For many adolescents, parenting of an infant is one such role. Thus early mother-infant interactions, an exacting real-life test of problem-solving and empathic abilities, would be expected to be constructed differently by young mothers having consolidated formal operations and advanced interpersonal concepts available to them as compared with mothers having less developed schemes.

What is it about the way adolescents reason that predisposes them as mothers to a lack of appreciation for the emotional complexities inherent in caring for a young child? The young mother's schemes of herself, other significant individuals in her life, and the psychological functioning of each in conflict-ridden situations may provide inadequate guidance for such emotionally ambivalent situations as comforting a colicky infant. Thus when these young women are thrown into disequilibrium and conflict, mastery of the conflict seems to require a simplistic acceptance or rejection of the situation--and the infant--or the development of more elaborate interpersonal concepts. Thus it is reasonable to expect that young mothers having developmental limitations in their concepts of themselves and of others would have less integration of accepting behaviors in their interactions than would mothers with more differentiated schemes. Further, it is expected that they would be less sensitive to and responsive to their infants' cues.

Similarly, it is reasonable to expect that more advanced logical-physical reasoning abilities (i.e. formal operations) enable a mother to reflect on her evolving relationship with her infant in more elaborated and differentiated schemes than can a mother with less developed abilities. Therefore, it was expected that a mother with more elaborated and differentiated logical-reasoning schemes would construct mother-infant interactions characterized by different sensorimotor properties and vocal characteristics from a mother with less developed schemes.

MATERIAL AND METHOD

The study subjects consisted of 36 primiparous, culturally homogeneous Caucasian women and their full-term, healthy infants delivered at one of two community hospitals in Madison, Wisconsin. Table 1 shows the sociodemographic characteristics of the sample. The mothers were from a wide range of socioeconomic backgrounds as measured by the Hollingshead Four Factor Index. Mothers ranged in age from 15 to 21 years; the mean age of the group was 17.9 years. There were 20 male and 16 female infants. Most of the sample were single (78%); and most were part of an extended family or cohabiting with the baby's father.

Data was collected during three home visits in the first four months postbirth. Selman's "concepts of persons" interview, revised for an infant crying situation, was conducted at one month. At four months, mothers and infants were videotaped

in their homes during play, infant teaching, and bathing and dressing. During a second visit at four months, multiple formal operations measures (Tomlinson-Keasey and Campbell Formal Operations Test and Siegler's Marbles and Balance Beam Tasks) and an intellectual aptitude measure (Raven Standard Progressive Matrices) were administered.

Three caregiving situations were videotaped. For the play situation, the mother was instructed to do what she would normally do when she was having fun with her baby. She was also asked to play with and without toys. The play situations lasted ten minutes or until the mother indicated that she was "finished" with a natural play session. For the teaching situation, the mother was asked to teach the infant three infant skills taken from the Bayley Scales of Infant Development. The three skills chosen were slightly difficult for four month old babies; they were 1) reaches for second cube; 2) lifts inverted cup to obtain toy; and 3) pulls string, secures ring. Finally, each mother was asked to bath and dress her baby as she would normally perform those activities.

For the data reported in this paper, videotapes were coded during three separate passes through the tapes by a coder blind to the cognitive status, age or background of individual mothers. Interrater reliability estimates were obtained by additional viewings of nine (25%) randomly selected tapes by the investigator.

Selman's Concepts of Persons Interview. Selman's (1979) "concepts of persons" interview, revised to an infant crying situation, was used to assess interpersonal understanding and social role-taking developmental status. The context-specific infant crying situation permitted use of Selman's formal model and interview protocols for functional analysis of a common and clinically important problem in young infant parenting. All interviews were transcribed verbatim from audiotapes. The transcripts were then scored according to Selman's (1979) protocols. Using Selman's structural descriptions describing four stages of interpersonal understanding, each subject was assigned an average stage score based upon her answers to questions about how the characters in the infant-crying situation function psychologically as well as to questions designed to assess the mother's understanding of the character's internal emotional complexity. In addition, each mother was assigned a stage score for four issue concepts: subjectivity, self-awareness, concepts of personality, and concepts of personality change (or how people grow up). All stage scores were assigned by the investigator in accordance with Selman's protocols. An independent rater, blind to the subjects' ages, backgrounds, or cognitive-developmental status, also scored nine (25%) randomly selected concepts of person interview transcripts. The interrater reliability for the four issue concept stage scores assigned by the independent rater and the investigator was .88; this interrater reliability approximates the .96 level reported by Selman.

Thirty-one of the thirty-six transcribed interviews were judged to be adequately standardized for reliable stage assignments.

Mother-Infant Interaction Measures

Vocal Stimulation

The quantity of vocal stimulation was assessed by coding the number of vocally active 10-second segments in the videotaped mother-infant interactions. A vocally active segment was defined as a ten-second time segment of interaction with one or more maternal utterances. A reliability estimate was calculated by a Pearson Product Moment correlation of the number of vocally active segments coded directly from viewing the tapes and the number of vocally active segments calculated from verbatim transcripts of the mother's utterances to the infant with time intervals indicated on the transcripts for n=9 (25%) of the randomly selected tapes. A correlation of r=.96 was obtained.

Maternal Responsiveness to Infant Vocal Cues

This dimension assessed the extent to which mothers promptly responded to their infants' behavioral cues. A maternal responsiveness score was obtained by calculating the number of cues perceived and responded to promptly by a mother over the total number of cues. A mother was found to have responded to a cue if a maternal response occurred within five seconds after a cue was given.

The coding system for maternal responsiveness was structured similarly to the Mash Response-Class Matrix developed by Mash, Terdal, and Anderson (1973). The Mash format allows the recording of maternal behaviors in response to specified antecedent child behaviors. Under the Mash format, a behavior is considered responsive if it occurs within a specified time after a designated child antecedent behavior occurs. The specified time in this study was five seconds.

Initial training efforts resulted in consistent and intractable difficulties in reliably coding infant behaviors other than infant utterances. Therefore only infant utterances were coded as infant antecedent behaviors. Interrater reliability was obtained by two independent observers; one was blind to each mother's background and cognitive status, and the other was the investigator. The session-wide reliability coefficient was .84. Cohen's Kappa reliability coefficient was .62.

Maternal Acceptance vs. Rejection of the Infant

This dimension assessed the balance between a mother's positive and negative feelings about her infant and the extent to which she has integrated these conflicting feelings in her mother-infant interactive style. An acceptance score and a rejection score were calculated to measure the balance of the accepting and rejecting elements in mothers' interactions with their infants. Both ratings and coded items assessed

the affective dimensions of maternal and verbal and tactile behavior. The acceptance score estimates the degree to which a mother expresses tenderness toward and delight in her infant and the rejection score estimates the degree to which a mother expresses irritation with and hostility toward her infant. Four qualitative ratings and two quantitative coded items were combined to yield an acceptance score. Three qualitative ratings and one quantitative coded item were combined to yield a rejection score.

An internal consistency item analysis yielded an alpha Cronbach coefficient of r=.82 for the acceptance score and of r=.64 for the rejection score. Low nonsignificant correlations between the acceptance and rejection scores suggests that acceptance and rejection are distinct constructs. Therefore, no combined acceptance/rejection score analyses were undertaken.

Estimates of interrater agreement for the acceptance scale was obtained by computing the correlations between the two independent coders; one coder was blind to the mother's age, background, and cognitive status and the other was the investigator. The Pearson Product Moment correlation between raters was r=.91.

Formal Operations Measures and Intellectual Aptitude

Four paper and pencil tasks assessing systematic search, isolation of variables, proportionality, probability, as developed by Tomlinson-Keasey and Campbell (1977), were administered at four months. In addition, Siegler's (1981) balance beam and marbles tasks, using the rule assessment technique, were administered.

The Raven Standard Progressive Matrices were administered without a time limit in order to obtain a marker measure of intellectual aptitude.

RESULTS

Intercorrelational analyses of the resulting data indicate that certain formal operations are related to the quantity and kind of verbal and tactile behavior in mothers' interactive schemes. The effects of formal operations on maternal interractive style are most pronounced in the teaching situation. (See Table 2.) Using Hotelling's t-test for significance of differences between two correlation coefficients that are correlated, the results, shown in Table 2, indicate the higher correlations between formal structures and vocal stimulation are genuinely higher in the teaching than in the bath or play situations. Thus, adolescent mothers demonstrating the availability of certain formal operations (i.e., probability, proportionality and isolation of variables) are better teachers with their four-month-old infants insofar as they vocalize more to their infants during structured teaching situations.

More advanced concepts of persons are also positively correlated with more vocal stimulation ($r=.50$, $p<.01$) with greater responsiveness to the infants' vocal cues ($r=.49$, $p<.01$) and with greater acceptance of the infant ($r=.49$, $p<.01$). Like correlations between formal operations and maternal interactive measures, the effects of the developmental status of interpersonal concepts on maternal interactive measures differed across caregiving situations. These data, shown in Table 3, suggest the higher correlations between concepts of persons and responsiveness were genuinely higher in the bathing situation than in the teaching or play situations. Similarly, the correlations between vocal stimulation and concepts about persons were higher in the bath situation than in the play or teaching situation.

Effects of SES and Raven

Some researchers emphasize the importance of socioeconomic status and intellectual aptitude in explaining differences in maternal behavior between adolescent and adult mothers (McAnarney, et al., 1984). Therefore, SES coefficients and Raven scores were partialled out of the correlations between cognitive-developmental measures and maternal interactive measures. These results, shown in table 5, indicate that correlations between cognitive-developmental measures and maternal interactive schemes were moderately attenuated by

removing the effects of SES and the Raven. In most cases, however, the attenuated correlations remain statistically significant. The remaining effect size may represent the developmental component of cognitive process in maternal interactive schemes.

CONCLUSIONS

These study data support explanatory models for adolescent parenting style assigning primary importance to the development of interpersonal concepts for explaining age-related differences in vocalizations to infants and in maternal responsiveness. In addition, the more modest effects of logical-physical reasoning on maternal interactive schemes appear to be manifest primarily in teaching situations. The uneven effects of cognitive-developmental functions across caregiving situations point to the need for contextual analyses of both the qualitative and quantitative elements of mother-infant interactions. These situational differences also raise the question of the possibility of a developmental hierarchy in caregiving situations.

Socioeconomic status and intellectual aptitude exert a slight attenuating effect on the relationship between cognitive-developmental functions and maternal behavior. In most cases, however, a statistically significant correlation remains after singularly or concurrently removing the effects of SES and intellectual aptitude.

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Table 1

Socioeconomic Status Distributions in Sample

SES Coefficient	N	Percentage
1 major business or professional	1	3%
2 medium business or minor professional	7	19%
3 skilled craftsmen or salesworkers	10	28%
4 semiskilled workers	10	28%
5 unskilled workers, welfare	8	22%

Mean SES = 3.47

n = 36

Age Distributions of Sample

Age	15-16	16-17	17-18	18-19	19-20	20-21	Total
N	1 (3%)	6 (17%)	7 (19%)	6 (17%)	13 (36%)	3 (8%)	36

Table 3

Correlations Among Concepts of Person Stage Scores and Selected Mother-Infant Interaction Measures Across Caregiving Situations

	Average Stage Score	Subjectivity	Self-Awareness	Concepts of Personality	Concepts of Change (Growing Up)
Responsiveness					
Bath	.56***	.31*	.48**	.41**	.40**
Teaching	-.19	-.21	-.09	-.28	-.01
Play	.17	.31*	.04	.18	-.01
Verbal Stimulation					
Bath	.60***	.20	.57***	.42**	.51**
Teaching	.38*	-.04	.61***	.23	.43**
Play	.21	.09	.31*	.27	.04

n = 31
*p < .05
**p < .01
***p < .001

Table 2

Intercorrelation Among Formal Operations Measures and Vocal Stimulation Across Caregiving Situations

	Bath	Teaching	Play	Confidence Intervals
Proportionality (TKC)	-.01	.07	-.23	NS
Probability (TKC)	.20	.50***	.16	.05<p<.025
Systematic Search (TKC)	.09	-.03	.17	NS
Strategy Score (TKC)	-.10	-.04	-.11	NS
Isolation of Variables (TKC)	.15	.42**	-.09	.10<p<.05
Siegler's Balance Beam	.09	.37*	.05	.10<p<.05
Siegler's Marbles Task	.28*	.21	-.05	NS

n = 36
*p < .05
**p < .01
***p < .001

*Confidence Intervals determined by applying Hotelling's t-test for differences in correlation coefficients that are correlated.

	Bath	Teach	Play	Confidence Intervals
Average Stage with Responsiveness	.56	-.19	---	.005<p<.0005
Average Stage with Responsiveness	.56	---	.17	.05<p<.025
Average Stage with Vocal Stimulation	.60	.38	---	.10<p<.05
Average Stage with Vocal Stimulation	.60	---	.20	.005<p<.0005

Table 5

Zero-Order and Partial Correlations for Selected Cognitive-Developmental and Maternal-Role Variables Controlling for Raven

	Vocal Stimulation (Total)	Vocal Stimulation (Teach)	Vocal Stimulation (Bath)	Acceptance
TKC-Probability	.29 (.34)*	.50 (.41)**	.29 (.32)*	.60 (.60)***
TKC-Isolation of Variables	.16 (.28)*	.42 (.25)	.18 (.25)	.39 (.41)**
Balance Beam	.16 (.19)	.37 (.33)*	.15 (.19)	.45 (.43)**
Marbles	.18 (.17)	.21 (.28)*	.40 (.38)**	.30 (.28)*
Average Stage*	.50 (.52)	.38 (.36)*	.60 (.61)***	.49 (.49)**

n=36
*n=31 for this variable only
Partial correlations in parentheses

*p < .05
**p < .01
***p < .001

Zero-Order and Partial Correlations for Selected Cognitive-Developmental and Maternal Role Variables Controlling for Socioeconomic Status

	Responsiveness	Vocal Stimulation (Total)	Acceptance	Rejection
Average Stage*	.49 (.46)**	.50 (.47)**	.49 (.40)**	-.15 (.00)
Probability (TKC)	.31 (.24)	.30 (.25)	.60 (.54)***	-.32(-.20)
Isolation of Variables	.22 (.14)	.16 (.11)	.39 (.29)*	-.18(-.01)
Balance Beam	.14 (.04)	.16 (.08)	.46 (.35)*	-.28(-.11)
Marbles	.18 (.16)	.18 (.16)	.30 (.30)*	.04 (.08)

n=36
*n=31
Partial correlations in parentheses

*p < .05
**p < .01
***p < .001

Zero-Order and Partial Correlations for Selected Cognitive-Developmental and Maternal-Role Variables Controlling Concurrently for Social Status and Raven Scores

	Responsiveness	Vocal Stimulation (Total)	Acceptance
Concepts of Persons* Average Stage Score	.49 (.43)**	.49 (.47)**	.49 (.40)**
Probability (TKC)	.31 (.24)	.30 (.29)	.60 (.58)***
Isolation of Variables	.22 (.15)	.16 (.26)	.39 (.39)**
Balance Beam	.14 (.02)	.16 (.13)	.45 (.37)*
Marbles	.18 (.16)	.18 (.17)	.30 (.30)*

*n=31
n=36

*p < .05
**p < .01
***p < .001